Claims:

1. A GLP-1 compound comprising a GLP-1 peptide modified with a reactive group that reacts with a thiol group on a blood component to form a covalent bond, wherein said reactive group is selected from the group consisting of an activated disulfide bond group or an S-sulfonate.

2. The GLP-1 compound of claim 1, said GLP-1 peptide having the amino acid sequence of formula 1 (SEQ ID NO:1)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Lys-Gly-Arg-Xaa_{37}

Formula 1 (SEQ ID NO: 1)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu;

Xaa_{33} is: Val, or Ile;

Xaa_{37} is: L-Cys, D-Cys, homocysteine, or penicillamine;

wherein said GLP-1 peptide is modified at Xaa_{37}; and

provided that the GLP-1 compound does not have the sequence of GLP-1(7-37)OH, GLP-1(7-36)-NH_2, Gly^8-GLP-1(7-37)OH, Gly^8-GLP-1(7-36)NH_2, Val^8-

GLP-1(7-37)OH, Val^8-GLP-1(7-36)NH_2, Leu^8-GLP-1(7-37)OH, Leu^8-GLP-1(7-36)NH_2, Ile^8-GLP-1(7-37)OH, Ile^8-GLP-1(7-36)NH_2, Ser^8-GLP-1(7-37)OH, Ser^8-GLP-1(7-36)NH_2, Thr^8-GLP-1(7-37)OH, Thr^8-GLP-1(7-36)NH_2, Val^8-Tyr^{12}-GLP-1(7-37)OH, Val^8-Tyr^{12}-GLP-1(7-36)NH_2, Val^8-Tyr^{16}-GLP-1(7-37)OH, Val^8-Tyr^{16}-GLP-1(7-36)NH_2, Val^8-Glu^{22}-GLP-1(7-37)OH, Val^8-Glu^{22}-GLP-1(7-36)NH_2, Gly^8-Glu^{22}-GLP-1(7-37)OH, Gly^8-Glu^{22}-GLP-1(7-36)NH_2, Val^8-Asp^{22}-GLP-1(7-37)OH, Val^8-Asp^{22}-GLP-1(7-36)NH_2, Gly^8-Asp^{22}-GLP-1(7-37)OH, Gly^8-Asp^{22}-GLP-1(7-36)NH_2, Val^8-Lys^{22}-GLP-1(7-37)OH, Val^8-Lys^{22}-GLP-1(7-36)NH_2, Gly^8-Lys^{22}-GLP-1(7-37)OH, Gly^8-Lys^{22}-GLP-1(7-36)NH_2, Leu^8-Glu^{22}-GLP-1(7-37)OH, Leu^8-Glu^{22}-GLP-1(7-36)NH_2, Ile^8-Glu^{22}-GLP-1(7-37)OH, Ile^8-Glu^{22}-GLP-1(7-36)NH_2, Leu^8-Asp^{22}-GLP-1(7-37)OH, Leu^8-Asp^{22}-GLP-1(7-36)NH_2, Ile^8-Asp^{22}-GLP-1(7-37)OH, Ile^8-Asp^{22}-GLP-1(7-36)NH_2, Leu^8-Lys^{22}-GLP-1(7-37)OH, Leu^8-Lys^{22}-GLP-1(7-36)NH_2, Ile^8-Lys^{22}-GLP-1(7-37)OH, Ile^8-Lys^{22}-GLP-1(7-36)NH_2, Ser^8-Glu^{22}-GLP-1(7-37)OH, Ser^8-Glu^{22}-GLP-1(7-36)NH_2, Thr^8-Glu^{22}-GLP-1(7-37)OH, Thr^8-Glu^{22}-GLP-1(7-36)NH_2, Ser^8-Asp^{22}-GLP-1(7-37)OH, Ser^8-Asp^{22}-GLP-1(7-36)NH_2, Thr^8-Asp^{22}-GLP-1(7-37)OH, Thr^8-Asp^{22}-GLP-1(7-36)NH_2, Ser^8-Lys^{22}-GLP-1(7-37)OH, Ser^8-Lys^{22}-GLP-1(7-36)NH_2, Thr^8-Lys^{22}-GLP-1(7-37)OH, Thr^8-Lys^{22}-GLP-1(7-36)NH_2, Glu^{22}-GLP-1(7-37)OH, Glu^{22}-GLP-1(7-36)NH_2, Asp^{22}-GLP-1(7-37)OH, Asp^{22}-GLP-1(7-36)NH_2, Lys^{22}-GLP-1(7-37)OH, Lys^{22}-GLP-1(7-36)NH_2, Val^8-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{22}-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-36)NH_2, Gly^8-Glu^{30}-GLP-1(7-37)OH, Gly^8-Glu^{30}-GLP-1(7-36)NH_2, Leu^8-Glu^{30}-GLP-1(7-37)OH, Leu^8-Glu^{30}-GLP-1(7-36)NH_2, Ile^8-Glu^{30}-GLP-1(7-37)OH, Ile^8-Glu^{30}-GLP-1(7-36)NH_2, Ser^8-Glu^{30}-GLP-1(7-37)OH, Ser^8-Glu^{30}-GLP-1(7-36)NH_2, Thr^8-Glu^{30}-GLP-1(7-37)OH, Thr^8-Glu^{30}-GLP-1(7-36)NH_2, Val^8-His^{37}-GLP-1(7-37)OH, Val^8-His^{37}-GLP-1(7-36)NH_2, Gly^8-His^{37}-GLP-1(7-37)OH, Gly^8-His^{37}-GLP-1(7-36)NH_2, Leu^8-His^{37}-GLP-1(7-37)OH, Leu^8-His^{37}-GLP-1(7-36)NH_2, Ile^8-His^{37}-GLP-1(7-37)OH, Ile^8-His^{37}-GLP-1(7-36)NH_2, Ser^8-His^{37}-GLP-1(7-37)OH, Ser^8-His^{37}-GLP-1(7-36)NH_2, Thr^8-His^{37}-GLP-1(7-37)OH, Thr^8-His^{37}-GLP-1(7-36)NH_2.

3. The GLP-1 compound of claim 1, said GLP-1 peptide having the amino acid sequence of formula 2 (SEQ ID NO:2)

Xaa_7-Xaa_8-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Tyr-Leu-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Glu-Phe-Ile-Ala-Trp-Leu-Xaa_{33}-Lys-Gly-Arg-Xaa_{37}

Formula 2 (SEQ ID NO:2)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Gly, Ala, Val, Leu, Ile, Ser, or Thr;

Xaa_{16} is: Val, Phe, Tyr, or Trp;

Xaa_{18} is: Ser, Tyr, Trp, Phe, Lys, Ile, Leu, or Val;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{33} is: Val or Ile; and

Xaa_{37} is: L-Cys, D-Cys, homocysteine, or penicillamine;

wherein said GLP-1 peptide is modified at Xaa_{37}; and

provided that the GLP-1 compound does not have the sequence of GLP-1(7-37)OH, GLP-1(7-36)-NH_2, Gly^8-GLP-1(7-37)OH, Gly^8-GLP-1(7-36)NH_2, Val^8-GLP-1(7-37)OH, Val^8-GLP-1(7-36)NH_2, Leu^8-GLP-1(7-37)OH, Leu^8-GLP-1(7-36)NH_2, Ile^8-GLP-1(7-37)OH, Ile^8-GLP-1(7-36)NH_2, Ser^8-GLP-1(7-37)OH, Ser^8-GLP-1(7-36)NH_2, Thr^8-GLP-1(7-37)OH, Thr^8-GLP-1(7-36)NH_2, Val^8-Tyr^{16}-GLP-1(7-37)OH, Val^8-Tyr^{16}-GLP-1(7-36)NH_2, Val^8-Glu^{22}-GLP-1(7-37)OH, Val^8-Glu^{22}-GLP-1(7-36)NH_2, Gly^8-Glu^{22}-GLP-1(7-37)OH, Gly^8-Glu^{22}-GLP-1(7-36)NH_2, Val^8-Asp^{22}-GLP-1(7-37)OH, Val^8-Asp^{22}-GLP-1(7-36)NH_2, Gly^8-Asp^{22}-GLP-1(7-37)OH, Gly^8-Asp^{22}-GLP-1(7-36)NH_2, Val^8-Lys^{22}-GLP-1(7-37)OH, Val^8-Lys^{22}-GLP-1(7-36)NH_2, Gly^8-Lys^{22}-GLP-1(7-37)OH, Gly^8-Lys^{22}-GLP-1(7-36)NH_2, Leu^8-Glu^{22}-GLP-1(7-37)OH, Leu^8-Glu^{22}-GLP-1(7-36)NH_2, Ile^8-Glu^{22}-GLP-1(7-37)OH, Ile^8-Glu^{22}-GLP-1(7-36)NH_2, Leu^8-Asp^{22}-GLP-1(7-37)OH, Leu^8-Asp^{22}-GLP-1(7-36)NH_2, Ile^8-Asp^{22}-GLP-1(7-37)OH, Ile^8-Asp^{22}-GLP-1(7-36)NH_2, Leu^8-Lys^{22}-GLP-1(7-37)OH, Leu^8-Lys^{22}-GLP-1(7-36)NH_2, Ile^8-Lys^{22}-

GLP-1(7-37)OH, Ile^8-Lys^{22}-GLP-1(7-36)NH_2, Ser^8-Glu^{22}-GLP-1(7-37)OH, Ser^8-Glu^{22}-GLP-1(7-36)NH_2, Thr^8-Glu^{22}-GLP-1(7-37)OH, Thr^8-Glu^{22}-GLP-1(7-36)NH_2, Ser^8-Asp^{22}-GLP-1(7-37)OH, Ser^8-Asp^{22}-GLP-1(7-36)NH_2, Thr^8-Asp^{22}-GLP-1(7-37)OH, Thr^8-Asp^{22}-GLP-1(7-36)NH_2, Ser^8-Lys^{22}-GLP-1(7-37)OH, Ser^8-Lys^{22}-GLP-1(7-36)NH_2, Thr^8-Lys^{22}-GLP-1(7-37)OH, Thr^8-Lys^{22}-GLP-1(7-36)NH_2, Glu^{22}-GLP-1(7-37)OH, Glu^{22}-GLP-1(7-36)NH_2, Asp^{22}-GLP-1(7-37)OH, Asp^{22}-GLP-1(7-36)NH_2, Lys^{22}-GLP-1(7-37)OH, Lys^{22}-GLP-1(7-36)NH_2.

4. The GLP-1 compound of claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 3 (SEQ ID NO:3)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}

Formula 3 (SEQ ID NO:3)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu;

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, Ser, L-Cys, D-Cys, homocysteine, or penicillamine;

Xaa_{38} is: Ser, Pro, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2;

Xaa_{39} is: Ser, Arg, Thr, Trp, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{40} is: Ser, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{42} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent; and

Xaa_{48} is: L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

wherein said extended GLP-1 peptide contains a single L-Cys, D-Cys, homocysteine, or penicillamine which occurs at one of Xaa_{37}, Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, or Xaa_{48}, said GLP-1 is modified at said single L-Cys, D-Cys, homocysteine, or penicillamine; and

provided that if Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, or Xaa_{47} is absent each amino acid downstream is absent and further provided that the GLP-1 peptide does not have the following C-terminal amino acid extension beginning at Xaa_{36}: Gly-Pro-Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH_2.

5. The GLP-1 compound of claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 4 (SEQ ID NO:4)

Xaa_7-Xaa_8-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Xaa_{16}-Ser-Ser-Tyr-Lys-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Glu-Phe-Ile-Ala-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-

Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}

Formula 4 (SEQ ID NO: 4)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, Ser, L-Cys, D-Cys, homocysteine, or penicillamine;

Xaa_{38} is: Ser, Pro, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{39} is: Ser, Arg, Thr, Trp, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{40} is: Ser, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{42} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent; and

Xaa_{48} is: L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

wherein said extended GLP-1 peptide contains a single L-Cys, D-Cys, homocysteine, or penicillamine which occurs at one of Xaa_{37}, Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, or Xaa_{48}, said GLP-1 is modified at said single L-Cys, D-Cys, homocysteine, or penicillamine; and provided that if Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, or Xaa_{47} is absent each amino acid downstream is absent and further provided that the GLP-1 peptide does not have the following C-terminal amino acid extension beginning at Xaa_{36}: Gly-Pro-Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH_2.

6. The GLP-1 compound of claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 5 (SEQ ID NO:5)

Xaa_7-Xaa_8-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Val-Ser-Ser-Tyr-Lys-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Glu-Phe-Ile-Ala-Trp-Leu-Xaa_{33}-Lys-Gly-Gly-Pro-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}- Xaa_{48}

Formula 5 (SEQ ID NO:5)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{33} is: Val or Ile;

Xaa_{38} is: Ser, Pro, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{39} is: Ser, Arg, Thr, Trp, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{40} is: Ser, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{42} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent; and

Xaa_{48} is: L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

wherein said extended GLP-1 peptide contains a single L-Cys, D-Cys, homocysteine, or penicillamine which occurs at one of Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, or Xaa_{48}, said GLP-1 is modified at said single L-Cys, D-Cys, homocysteine, or penicillamine; and provided that if Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, or Xaa_{47} is absent each amino acid downstream is absent.

7. The GLP-1 compound of claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 6 (SEQ ID NO:6)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}-Xaa_{49}-Xaa_{50}-Xaa_{51}

Formula 6 (SEQ ID NO:6)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, or Ser;

Xaa_{38} is: Ser, Pro, or His;

Xaa_{39} is: Ser, Arg, Thr, Trp, or Lys;

Xaa_{40} is: Ser or Gly;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, or Gly;

Xaa_{42} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, Pro, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{48} is: Gly, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{49} is: Pro, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{50} is: Ser, His, Ser-NH_2, His-NH_2, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent; and

Xaa_{51} is: L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

wherein said extended GLP-1 peptide contains a single L-Cys, D-Cys, homocysteine, or penicillamine which occurs at one of Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, Xaa_{50}, or Xaa_{51} said GLP-1 is modified at said single L-Cys, D-Cys, homocysteine,

or penicillamine; and provided that if Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, or Xaa_{50}, is absent each amino acid downstream is absent and

further provided that if Xaa_{36} is Arg and Xaa_{37} is Gly or Ser, the GLP-1 peptide does not have the following C-terminal amino acid extension beginning at Xaa_{38}: Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH_2.

8. The GLP-1 compound of claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 7 (SEQ ID NO:7)

His-Ala-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Val-Ser-Ser-Tyr-Leu-Glu-Gly-Gln-Ala-Ala-Lys-Glu-Phe-Ile-Ala-Trp-Leu-Val-Lys-Gly-Gly-Pro-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}-Xaa_{49}-Xaa_{50}- Xaa_{51}

Formula 7 (SEQ ID NO:7)

Wherein:

Xaa_{38} is: Ser, Pro, orHis;

Xaa_{39} is: Ser, Arg, Thr, Trp, or Lys;

Xaa_{40} is: Ser or Gly;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, or Gly;

Xaa_{42} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, Pro, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{48} is: Gly, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{49} is: Pro, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{50} is: Ser, His, Ser-NH_2, His-NH_2, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent; and

Xaa_{51} is: L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;
wherein said extended GLP-1 peptide contains a single L-Cys, D-Cys, homocysteine, or penicillamine which occurs at one of Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, Xaa_{50}, or Xaa_{51} said GLP-1 is modified at said single L-Cys, D-Cys, homocysteine, or penicillamine; and provided that if Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, or Xaa_{50}, is absent each amino acid downstream is absent.

9. The GLP-1 compound of Claim 1, said GLP-1 peptide having the amino acid sequence of formula 8 (SEQ ID NO:8)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Lys-Gly-Arg-Lys

Formula 8 (SEQ ID NO:8)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu; and

Xaa_{33} is: Val, or Ile;

wherein said GLP-1 peptide is modified at Lys^{37}; and,

provided that the GLP-1 compound does not have the sequence of GLP-1(7-37)OH, GLP-1(7-36)-NH_2, Gly^8-GLP-1(7-37)OH, Gly^8-GLP-1(7-36)NH_2, Val^8-GLP-1(7-37)OH, Val^8-GLP-1(7-36)NH_2, Leu^8-GLP-1(7-37)OH, Leu^8-GLP-1(7-

36)NH_2, Ile^8-GLP-1(7-37)OH, Ile^8-GLP-1(7-36)NH_2, Ser^8-GLP-1(7-37)OH, Ser^8-GLP-1(7-36)NH_2, Thr^8-GLP-1(7-37)OH, Thr^8-GLP-1(7-36)NH_2, Val^8-Tyr^{12}-GLP-1(7-37)OH, Val^8-Tyr^{12}-GLP-1(7-36)NH_2, Val^8-Tyr^{16}-GLP-1(7-37)OH, Val^8-Tyr^{16}-GLP-1(7-36)NH_2, Val^8-Glu^{22}-GLP-1(7-37)OH, Val^8-Glu^{22}-GLP-1(7-36)NH_2, Gly^8-Glu^{22}-GLP-1(7-37)OH, Gly^8-Glu^{22}-GLP-1(7-36)NH_2, Val^8-Asp^{22}-GLP-1(7-37)OH, Val^8-Asp^{22}-GLP-1(7-36)NH_2, Gly^8-Asp^{22}-GLP-1(7-37)OH, Gly^8-Asp^{22}-GLP-1(7-36)NH_2, Val^8-Lys^{22}-GLP-1(7-37)OH, Val^8-Lys^{22}-GLP-1(7-36)NH_2, Gly^8-Lys^{22}-GLP-1(7-37)OH, Gly^8-Lys^{22}-GLP-1(7-36)NH_2, Leu^8-Glu^{22}-GLP-1(7-37)OH, Leu^8-Glu^{22}-GLP-1(7-36)NH_2, Ile^8-Glu^{22}-GLP-1(7-37)OH, Ile^8-Glu^{22}-GLP-1(7-36)NH_2, Leu^8-Asp^{22}-GLP-1(7-37)OH, Leu^8-Asp^{22}-GLP-1(7-36)NH_2, Ile^8-Asp^{22}-GLP-1(7-37)OH, Ile^8-Asp^{22}-GLP-1(7-36)NH_2, Leu^8-Lys^{22}-GLP-1(7-37)OH, Leu^8-Lys^{22}-GLP-1(7-36)NH_2, Ile^8-Lys^{22}-GLP-1(7-37)OH, Ile^8-Lys^{22}-GLP-1(7-36)NH_2, Ser^8-Glu^{22}-GLP-1(7-37)OH, Ser^8-Glu^{22}-GLP-1(7-36)NH_2, Thr^8-Glu^{22}-GLP-1(7-37)OH, Thr^8-Glu^{22}-GLP-1(7-36)NH_2, Ser^8-Asp^{22}-GLP-1(7-37)OH, Ser^8-Asp^{22}-GLP-1(7-36)NH_2, Thr^8-Asp^{22}-GLP-1(7-37)OH, Thr^8-Asp^{22}-GLP-1(7-36)NH_2, Ser^8-Lys^{22}-GLP-1(7-37)OH, Ser^8-Lys^{22}-GLP-1(7-36)NH_2, Thr^8-Lys^{22}-GLP-1(7-37)OH, Thr^8-Lys^{22}-GLP-1(7-36)NH_2, Glu^{22}-GLP-1(7-37)OH, Glu^{22}-GLP-1(7-36)NH_2, Asp^{22}-GLP-1(7-37)OH, Asp^{22}-GLP-1(7-36)NH_2, Lys^{22}-GLP-1(7-37)OH, Lys^{22}-GLP-1(7-36)NH_2, Val^8-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{22}-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-36)NH_2, Gly^8-Glu^{30}-GLP-1(7-37)OH, Gly^8-Glu^{30}-GLP-1(7-36)NH_2, Leu^8-Glu^{30}-GLP-1(7-37)OH, Leu^8-Glu^{30}-GLP-1(7-36)NH_2, Ile^8-Glu^{30}-GLP-1(7-37)OH, Ile^8-Glu^{30}-GLP-1(7-36)NH_2, Ser^8-Glu^{30}-GLP-1(7-37)OH, Ser^8-Glu^{30}-GLP-1(7-36)NH_2, Thr^8-Glu^{30}-GLP-1(7-37)OH, Thr^8-Glu^{30}-GLP-1(7-36)NH_2, Val^8-His^{37}-GLP-1(7-37)OH, Val^8-His^{37}-GLP-1(7-36)NH_2, Gly^8-His^{37}-GLP-1(7-37)OH, Gly^8-His^{37}-GLP-1(7-36)NH_2, Leu^8-His^{37}-GLP-1(7-37)OH, Leu^8-His^{37}-GLP-1(7-36)NH_2, Ile^8-His^{37}-GLP-1(7-37)OH, Ile^8-His^{37}-GLP-1(7-36)NH_2, Ser^8-His^{37}-GLP-1(7-37)OH, Ser^8-His^{37}-GLP-1(7-36)NH_2, Thr^8-His^{37}-GLP-1(7-37)OH, Thr^8-His^{37}-GLP-1(7-36)NH_2, Lys^{37}-GLP-1(7-37)OH.

10 The GLP-1 compound of Claim 1, said GLP-1 peptide having the amino acid sequence of formula 9 (SEQ ID NO:9)

Xaa_7-Xaa_8-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Tyr-Leu-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Glu-Phe-Ile-Ala-Trp-Leu-Xaa_{33}-Lys-Gly-Arg-Lys

Formula 9 (SEQ ID NO:9)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Gly, Ala, Val, Leu, Ile, Ser, or Thr;

Xaa_{16} is: Val, Phe, Tyr, or Trp;

Xaa_{18} is: Ser, Tyr, Trp, Phe, Lys, Ile, Leu, or Val;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu; and

Xaa_{33} is: Val or Ile;

wherein said GLP-1 peptide is modified at Lys^{37}; and,

provided that the GLP-1 compound does not have the sequence of GLP-1(7-37)OH, GLP-1(7-36)-NH_2, Gly^8-GLP-1(7-37)OH, Gly^8-GLP-1(7-36)NH_2, Val^8-GLP-1(7-37)OH, Val^8-GLP-1(7-36)NH_2, Leu^8-GLP-1(7-37)OH, Leu^8-GLP-1(7-36)NH_2, Ile^8-GLP-1(7-37)OH, Ile^8-GLP-1(7-36)NH_2, Ser^8-GLP-1(7-37)OH, Ser^8-GLP-1(7-36)NH_2, Thr^8-GLP-1(7-37)OH, Thr^8-GLP-1(7-36)NH_2, Val^8-Tyr^{12}-GLP-1(7-37)OH, Val^8-Tyr^{12}-GLP-1(7-36)NH_2, Val^8-Tyr^{16}-GLP-1(7-37)OH, Val^8-Tyr^{16}-GLP-1(7-36)NH_2, Val^8-Glu^{22}-GLP-1(7-37)OH, Val^8-Glu^{22}-GLP-1(7-36)NH_2, Gly^8-Glu^{22}-GLP-1(7-37)OH, Gly^8-Glu^{22}-GLP-1(7-36)NH_2, Val^8-Asp^{22}-GLP-1(7-37)OH, Val^8-Asp^{22}-GLP-1(7-36)NH_2, Gly^8-Asp^{22}-GLP-1(7-37)OH, Gly^8-Asp^{22}-GLP-1(7-36)NH_2, Val^8-Lys^{22}-GLP-1(7-37)OH, Val^8-Lys^{22}-GLP-1(7-36)NH_2, Gly^8-Lys^{22}-GLP-1(7-37)OH, Gly^8-Lys^{22}-GLP-1(7-36)NH_2, Leu^8-Glu^{22}-GLP-1(7-37)OH, Leu^8-Glu^{22}-GLP-1(7-36)NH_2, Ile^8-Glu^{22}-GLP-1(7-37)OH, Ile^8-Glu^{22}-GLP-1(7-36)NH_2, Leu^8-Asp^{22}-GLP-1(7-37)OH, Leu^8-Asp^{22}-GLP-1(7-36)NH_2, Ile^8-Asp^{22}-GLP-1(7-37)OH, Ile^8-Asp^{22}-GLP-1(7-36)NH_2, Leu^8-Lys^{22}-GLP-1(7-37)OH, Leu^8-Lys^{22}-GLP-1(7-36)NH_2, Ile^8-Lys^{22}-GLP-1(7-37)OH, Ile^8-

Lys^{22}-GLP-1(7-36)NH_2, Ser^8-Glu^{22}-GLP-1(7-37)OH, Ser^8-Glu^{22}-GLP-1(7-36)NH_2, Thr^8-Glu^{22}-GLP-1(7-37)OH, Thr^8-Glu^{22}-GLP-1(7-36)NH_2, Ser^8-Asp^{22}-GLP-1(7-37)OH, Ser^8-Asp^{22}-GLP-1(7-36)NH_2, Thr^8-Asp^{22}-GLP-1(7-37)OH, Thr^8-Asp^{22}-GLP-1(7-36)NH_2, Ser^8-Lys^{22}-GLP-1(7-37)OH, Ser^8-Lys^{22}-GLP-1(7-36)NH_2, Thr^8-Lys^{22}-GLP-1(7-37)OH, Thr^8-Lys^{22}-GLP-1(7-36)NH_2, Glu^{22}-GLP-1(7-37)OH, Glu^{22}-GLP-1(7-36)NH_2, Asp^{22}-GLP-1(7-37)OH, Asp^{22}-GLP-1(7-36)NH_2, Lys^{22}-GLP-1(7-37)OH, Lys^{22}-GLP-1(7-36)NH_2, Val^8-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{22}-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-36)NH_2, Gly^8-Glu^{30}-GLP-1(7-37)OH, Gly^8-Glu^{30}-GLP-1(7-36)NH_2, Leu^8-Glu^{30}-GLP-1(7-37)OH, Leu^8-Glu^{30}-GLP-1(7-36)NH_2, Ile^8-Glu^{30}-GLP-1(7-37)OH, Ile^8-Glu^{30}-GLP-1(7-36)NH_2, Ser^8-Glu^{30}-GLP-1(7-37)OH, Ser^8-Glu^{30}-GLP-1(7-36)NH_2, Thr^8-Glu^{30}-GLP-1(7-37)OH, Thr^8-Glu^{30}-GLP-1(7-36)NH_2, Val^8-His^{37}-GLP-1(7-37)OH, Val^8-His^{37}-GLP-1(7-36)NH_2, Gly^8-His^{37}-GLP-1(7-37)OH, Gly^8-His^{37}-GLP-1(7-36)NH_2, Leu^8-His^{37}-GLP-1(7-37)OH, Leu^8-His^{37}-GLP-1(7-36)NH_2, Ile^8-His^{37}-GLP-1(7-37)OH, Ile^8-His^{37}-GLP-1(7-36)NH_2, Ser^8-His^{37}-GLP-1(7-37)OH, Ser^8-His^{37}-GLP-1(7-36)NH_2, Thr^8-His^{37}-GLP-1(7-37)OH, Thr^8-His^{37}-GLP-1(7-36)NH_2, Lys^{37}-GLP-1(7-37)OH.

11. The GLP-1 compound of Claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 10 (SEQ ID NO:10)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}

Formula 10 (SEQ ID NO:10)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu;

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, Ser, or Lys;

Xaa_{38} is: Ser, Pro, His, Lys, NH_2;

Xaa_{39} is: Ser, Arg, Thr, Trp, Lys, NH_2, or is absent;

Xaa_{40} is: Ser, Gly, Lys, NH_2, or is absent;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, Gly, NH_2, or is absent;

Xaa_{42} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, NH_2, or is absent; and

Xaa_{48} is: Lys, NH_2, or is absent;

wherein said extended GLP-1 peptide is modified at a single Lys which occurs at one of Xaa_{37}, Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, or Xaa_{48}; and provided that if Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, or Xaa_{47} is absent each amino acid downstream is absent and further provided that the GLP-1 peptide does not have the following C-terminal amino acid extension beginning at Xaa_{36}: Gly-Pro-Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH_2.

12. The GLP-1 compound of Claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 11 (SEQ ID NO:11)

Xaa_7-Xaa_8-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Xaa_{16}-Ser-Ser-Tyr-Lys-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Glu-Phe-Ile-Ala-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}

Formula 11 (SEQ ID NO:11)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, Ser, or Lys;

Xaa_{38} is: Ser, Pro, His, Lys, NH_2, or is absent;

Xaa_{39} is: Ser, Arg, Thr, Trp, Lys, NH_2, or is absent;

Xaa_{40} is: Ser, Gly, Lys, NH_2, or is absent;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, Gly, NH_2, or is absent;

Xaa_{42} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, NH_2, or is absent; and

Xaa_{48} is: Lys, NH_2, or is absent;

wherein said extended GLP-1 peptide is modified at a single Lys which occurs at one of Xaa_{37}, Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47},

or Xaa_{48}; and provided that if Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, or Xaa_{47} is absent each amino acid downstream is absent and further provided that the GLP-1 peptide does not have the following C-terminal amino acid extension beginning at Xaa_{36}: Gly-Pro-Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH_2.

13. The GLP-1 compound of Claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 12 (SEQ ID NO:12)

Xaa_7-Xaa_8-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Val-Ser-Ser-Tyr-Lys-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Glu-Phe-Ile-Ala-Trp-Leu-Xaa_{33}-Lys-Gly-Gly-Pro-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}- Xaa_{48}

Formula 12 (SEQ ID NO:12)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{33} is: Val or Ile;

Xaa_{38} is: Ser, Pro, His, Lys, NH_2, or is absent;

Xaa_{39} is: Ser, Arg, Thr, Trp, Lys, NH_2, or is absent;

Xaa_{40} is: Ser, Gly, Lys, NH_2, or is absent;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, Gly, NH_2, or is absent;

Xaa_{42} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, NH_2, or is absent; and

Xaa_{48} is: Lys, NH_2, or is absent;

wherein said extended GLP-1 peptide is modified at a single Lys which occurs at one of Xaa_{37}, Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, or Xaa_{48}; and provided that if Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, or Xaa_{47} is absent each amino acid downstream is absent.

14. The GLP-1 compound of Claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 13 (SEQ ID NO:13)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}-Xaa_{49}-Xaa_{50}- Xaa_{51}

Formula 13 (SEQ ID NO:13)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, or Ser;

Xaa_{38} is: Ser, Pro, or His;

Xaa_{39} is: Ser, Arg, Thr, Trp, or Lys;

Xaa_{40} is: Ser or Gly;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, or Gly;

Xaa_{42} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, NH_2, or is absent; and

Xaa_{48} is: Lys, NH_2, or is absent;

Xaa_{49} is: Pro, His, Lys, NH_2, or is absent;

Xaa_{50} is: Ser, His, Lys, NH_2, or is absent; and

Xaa_{51} is: Lys, NH_2, or is absent;

wherein said extended GLP-1 peptide is modified at a single Lys which occurs at one of Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, Xaa_{50}, or Xaa_{51}; and provided that if Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, or Xaa_{50}, is absent each amino acid downstream is absent.

15. The GLP-1 compound of Claim 1, wherein said GLP-1 peptide is an extended GLP-1 peptide having the amino acid sequence of formula 14 (SEQ ID NO:14)

His-Ala-Glu-Gly-Thr-Phe-Thr-Ser-Asp-Val-Ser-Ser-Tyr-Leu-Glu-Gly-Gln-Ala-Ala-Lys-Glu-Phe-Ile-Ala-Trp-Leu-Val-Lys-Gly-Gly-Pro-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}-Xaa_{49}-Xaa_{50}- Xaa_{51}

Formula 14 (SEQ ID NO:14)

Wherein:

Xaa_{38} is: Ser, Pro, or His;

Xaa_{39} is: Ser, Arg, Thr, Trp, or Lys;

Xaa_{40} is: Ser or Gly;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, or Gly;

Xaa_{42} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, NH_2, or is absent; and

Xaa_{48} is: Lys, NH_2, or is absent;

Xaa_{49} is: Pro, His, Lys, NH_2, or is absent;

Xaa_{50} is: Ser, His, Lys, NH_2, or is absent; and

Xaa_{51} is: Lys, NH_2, or is absent;

wherein said extended GLP-1 peptide is modified at a single Lys which occurs at one of Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, Xaa_{50}, or Xaa_{51}; and provided that if Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, or Xaa_{50}, is absent each amino acid downstream is absent.

16. The GLP-1 compound of any of claims 1-15 wherein said reactive group is an activated disulfide bond group.

17. The GLP-1 compound of any of claims 1-15 wherein said reactive group is an S-sulfonate.

18. A GLP-1 compound comprising a GLP-1 peptide modified with a reactive group that reacts with an amino group, a hydroxyl group, or a thiol group on a blood component to form a covalent bond, wherein said reactive group is selected from the group consisting of a succinimidyl group and a maleimido group, said GLP-1 peptide having the amino acid sequence of formula 15 (SEQ ID NO:15)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Lys-Gly-Arg-Xaa_{37}

Formula 15 (SEQ ID NO:15)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu

Xaa_{33} is: Val, or Ile; and

Xaa_{37} is: Gly, His, Lys, or NH_2, or is absent,

provided that the GLP-1 compound does not have the sequence of GLP-1(7-37)OH, GLP-1(7-36)-NH_2, Gly^8-GLP-1(7-37)OH, Gly^8-GLP-1(7-36)NH_2, Val^8-GLP-1(7-37)OH, Val^8-GLP-1(7-36)NH_2, Leu^8-GLP-1(7-37)OH, Leu^8-GLP-1(7-36)NH_2, Ile^8-GLP-1(7-37)OH, Ile^8-GLP-1(7-36)NH_2, Ser^8-GLP-1(7-37)OH, Ser^8-GLP-1(7-36)NH_2, Thr^8-GLP-1(7-37)OH, Thr^8-GLP-1(7-36)NH_2, Val^8-Tyr^{12}-GLP-1(7-37)OH, Val^8-Tyr^{12}-GLP-1(7-36)NH_2, Val^8-Tyr^{16}-GLP-1(7-37)OH, Val^8-Tyr^{16}-GLP-1(7-36)NH_2, Val^8-Glu^{22}-GLP-1(7-37)OH, Val^8-Glu^{22}-GLP-1(7-36)NH_2, Gly^8-Glu^{22}-GLP-1(7-37)OH, Gly^8-Glu^{22}-GLP-1(7-36)NH_2, Val^8-Asp^{22}-GLP-1(7-37)OH, Val^8-Asp^{22}-GLP-1(7-36)NH_2, Gly^8-Asp^{22}-GLP-1(7-37)OH, Gly^8-Asp^{22}-GLP-1(7-36)NH_2, Val^8-Lys^{22}-GLP-1(7-37)OH, Val^8-Lys^{22}-GLP-1(7-36)NH_2, Gly^8-Lys^{22}-GLP-1(7-37)OH, Gly^8-Lys^{22}-GLP-1(7-36)NH_2, Leu^8-Glu^{22}-GLP-1(7-37)OH, Leu^8-Glu^{22}-GLP-1(7-36)NH_2, Ile^8-Glu^{22}-GLP-1(7-37)OH, Ile^8-Glu^{22}-GLP-1(7-36)NH_2, Leu^8-Asp^{22}-GLP-1(7-37)OH, Leu^8-Asp^{22}-GLP-1(7-36)NH_2, Ile^8-Asp^{22}-GLP-1(7-37)OH, Ile^8-Asp^{22}-GLP-1(7-36)NH_2, Leu^8-Lys^{22}-GLP-1(7-37)OH, Leu^8-Lys^{22}-GLP-1(7-36)NH_2, Ile^8-Lys^{22}-GLP-1(7-37)OH, Ile^8-Lys^{22}-GLP-1(7-36)NH_2, Ser^8-Glu^{22}-GLP-1(7-37)OH, Ser^8-Glu^{22}-GLP-1(7-36)NH_2, Thr^8-Glu^{22}-GLP-1(7-37)OH, Thr^8-Glu^{22}-GLP-1(7-36)NH_2, Ser^8-Asp^{22}-GLP-1(7-37)OH, Ser^8-Asp^{22}-GLP-1(7-36)NH_2, Thr^8-Asp^{22}-GLP-1(7-37)OH, Thr^8-Asp^{22}-GLP-1(7-36)NH_2, Ser^8-Lys^{22}-GLP-1(7-37)OH, Ser^8-Lys^{22}-GLP-1(7-

36)NH_2, Thr^8-Lys^{22}-GLP-1(7-37)OH, Thr^8-Lys^{22}-GLP-1(7-36)NH_2, Glu^{22}-GLP-1(7-37)OH, Glu^{22}-GLP-1(7-36)NH_2, Asp^{22}-GLP-1(7-37)OH, Asp^{22}-GLP-1(7-36)NH_2, Lys^{22}-GLP-1(7-37)OH, Lys^{22}-GLP-1(7-36)NH_2, Val^8-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{22}-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-36)NH_2, Gly^8-Glu^{30}-GLP-1(7-37)OH, Gly^8-Glu^{30}-GLP-1(7-36)NH_2, Leu^8-Glu^{30}-GLP-1(7-37)OH, Leu^8-Glu^{30}-GLP-1(7-36)NH_2, Ile^8-Glu^{30}-GLP-1(7-37)OH, Ile^8-Glu^{30}-GLP-1(7-36)NH_2, Ser^8-Glu^{30}-GLP-1(7-37)OH, Ser^8-Glu^{30}-GLP-1(7-36)NH_2, Thr^8-Glu^{30}-GLP-1(7-37)OH, Thr^8-Glu^{30}-GLP-1(7-36)NH_2, Val^8-His^{37}-GLP-1(7-37)OH, Val^8-His^{37}-GLP-1(7-36)NH_2, Gly^8-His^{37}-GLP-1(7-37)OH, Gly^8-His^{37}-GLP-1(7-36)NH_2, Leu^8-His^{37}-GLP-1(7-37)OH, Leu^8-His^{37}-GLP-1(7-36)NH_2, Ile^8-His^{37}-GLP-1(7-37)OH, Ile^8-His^{37}-GLP-1(7-36)NH_2, Ser^8-His^{37}-GLP-1(7-37)OH, Ser^8-His^{37}-GLP-1(7-36)NH_2, Thr^8-His^{37}-GLP-1(7-37)OH, Thr^8-His^{37}-GLP-1(7-36)NH_2, Lys^{37}-GLP-1(7-37)OH.

19. The GLP-1 compound of Claim 18, wherein Xaa_{37} of said GLP-1 peptide is Lys and said GLP-1 peptide is modified at Xaa_{37}.

20. A GLP-1 compound comprising an extended GLP-1 peptide modified with a reactive group that reacts with an amino group, a hydroxyl group, or a thiol group on a blood component to form a covalent bond, wherein said reactive group is selected from the group consisting of a succinimidyl group and a maleimido group, said extended GLP-1 peptide having the amino acid sequence of formula 10 (SEQ ID NO:10)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}

Formula 10 (SEQ ID NO:10)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, Ser, or Lys;

Xaa_{38} is: Ser, Pro, His, or Lys;

Xaa_{39} is: Ser, Arg, Thr, Trp, Lys, NH_2, or is absent;

Xaa_{40} is: Ser, Gly, Lys, NH_2, or is absent;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, Gly, Lys, NH_2, or is absent;

Xaa_{42} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, NH_2 or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, NH_2 or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, NH_2 or is absent; and

Xaa_{48} is Lys, NH_2, or is absent;

provided that if Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, or Xaa_{47} is absent each amino acid downstream is absent and further provided that the GLP-1 peptide does not have the following C-terminal amino acid extension beginning at Xaa_{36}: Gly-Pro-Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH_2.

21. The GLP-1 compound of Claim 20, wherein said GLP-1 peptide is modified at a Lys, and said Lys occurs at either Xaa_{37}, Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, or Xaa_{48}.

22. A GLP-1 compound comprising an extended GLP-1 peptide modified with a reactive group that reacts with an amino group, a hydroxyl group, or a thiol group on a blood component to form a covalent bond, wherein said reactive group is selected from the group consisting of a succinimidyl group and a maleimido group, said extended GLP-1 peptide having the amino acid sequence of formula 13 (SEQ ID NO:13)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}-Xaa_{49}-Xaa_{50}- Xaa_{51}

Formula 13 (SEQ ID NO:13)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, or Ser;

Xaa_{38} is: Ser, Pro, or His;

Xaa_{39} is: Ser, Arg, Thr, Trp, or Lys;

Xaa_{40} is: Ser or Gly;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, or Gly;

Xaa_{42} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, Lys, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, NH_2, or is absent; and

Xaa_{48} is: Lys, NH_2, or is absent;

Xaa_{49} is: Pro, His, Lys, NH_2, or is absent;

Xaa_{50} is: Ser, His, Lys, NH_2, or is absent; and

Xaa_{51} is: Lys, NH_2, or is absent;

wherein said extended GLP-1 peptide is modified at a single Lys which occurs at one of Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, Xaa_{50} or Xaa_{51}; and provided that if Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, or Xaa_{50}, is absent each amino acid downstream is absent.

23. The GLP-1 compound of Claim 22, wherein said GLP-1 peptide is modified at a Lys, and said Lys occurs at either Xaa_{37}, Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, Xaa_{50} or Xaa_{51}.

24. The GLP-1 compound as in any of claims 12-23 wherein said reactive group is a succinimidyl group.

25. The GLP-1 compound as in any of claims 12-23 wherein said reactive group is a maleimido group.

26. A GLP-1 compound comprising a GLP-1 peptide modified with a reactive group that reacts with a thiol group on a blood component to form a covalent bond, wherein said reactive group is a succinimidyl group, said GLP-1 peptide having the amino acid sequence of formula 1 (SEQ ID NO:1)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Lys-Gly-Arg-Xaa_{37}

Formula 1 (SEQ ID NO:1)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu;

Xaa_{33} is: Val, or Ile; and

Xaa_{37} is: L-Cys, D-Cys, homocysteine, or penicillamine;

wherein said GLP-1 peptide is modified at Xaa_{37}; and

provided that the GLP-1 compound does not have the sequence of GLP-1(7-37)OH, GLP-1(7-36)-NH_2, Gly^8-GLP-1(7-37)OH, Gly^8-GLP-1(7-36)NH_2, Val^8-GLP-1(7-37)OH, Val^8-GLP-1(7-36)NH_2, Leu^8-GLP-1(7-37)OH, Leu^8-GLP-1(7-36)NH_2, Ile^8-GLP-1(7-37)OH, Ile^8-GLP-1(7-36)NH_2, Ser^8-GLP-1(7-37)OH, Ser^8-GLP-1(7-36)NH_2, Thr^8-GLP-1(7-37)OH, Thr^8-GLP-1(7-36)NH_2, Val^8-Tyr^{12}-GLP-1(7-37)OH, Val^8-Tyr^{12}-GLP-1(7-36)NH_2, Val^8-Tyr^{16}-GLP-1(7-37)OH, Val^8-Tyr^{16}-GLP-1(7-36)NH_2, Val^8-Glu^{22}-GLP-1(7-37)OH, Val^8-Glu^{22}-GLP-1(7-

36)NH_2, Gly^8-Glu^{22}-GLP-1(7-37)OH, Gly^8-Glu^{22}-GLP-1(7-36)NH_2, Val^8-Asp^{22}-GLP-1(7-37)OH, Val^8-Asp^{22}-GLP-1(7-36)NH_2, Gly^8-Asp^{22}-GLP-1(7-37)OH, Gly^8-Asp^{22}-GLP-1(7-36)NH_2, Val^8-Lys^{22}-GLP-1(7-37)OH, Val^8-Lys^{22}-GLP-1(7-36)NH_2, Gly^8-Lys^{22}-GLP-1(7-37)OH, Gly^8-Lys^{22}-GLP-1(7-36)NH_2, Leu^8-Glu^{22}-GLP-1(7-37)OH, Leu^8-Glu^{22}-GLP-1(7-36)NH_2, Ile^8-Glu^{22}-GLP-1(7-37)OH, Ile^8-Glu^{22}-GLP-1(7-36)NH_2, Leu^8-Asp^{22}-GLP-1(7-37)OH, Leu^8-Asp^{22}-GLP-1(7-36)NH_2, Ile^8-Asp^{22}-GLP-1(7-37)OH, Ile^8-Asp^{22}-GLP-1(7-36)NH_2, Leu^8-Lys^{22}-GLP-1(7-37)OH, Leu^8-Lys^{22}-GLP-1(7-36)NH_2, Ile^8-Lys^{22}-GLP-1(7-37)OH, Ile^8-Lys^{22}-GLP-1(7-36)NH_2, Ser^8-Glu^{22}-GLP-1(7-37)OH, Ser^8-Glu^{22}-GLP-1(7-36)NH_2, Thr^8-Glu^{22}-GLP-1(7-37)OH, Thr^8-Glu^{22}-GLP-1(7-36)NH_2, Ser^8-Asp^{22}-GLP-1(7-37)OH, Ser^8-Asp^{22}-GLP-1(7-36)NH_2, Thr^8-Asp^{22}-GLP-1(7-37)OH, Thr^8-Asp^{22}-GLP-1(7-36)NH_2, Ser^8-Lys^{22}-GLP-1(7-37)OH, Ser^8-Lys^{22}-GLP-1(7-36)NH_2, Thr^8-Lys^{22}-GLP-1(7-37)OH, Thr^8-Lys^{22}-GLP-1(7-36)NH_2, Glu^{22}-GLP-1(7-37)OH, Glu^{22}-GLP-1(7-36)NH_2, Asp^{22}-GLP-1(7-37)OH, Asp^{22}-GLP-1(7-36)NH_2, Lys^{22}-GLP-1(7-37)OH, Lys^{22}-GLP-1(7-36)NH_2, Val^8-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{22}-Ala^{27}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-37)OH, Val^8-Glu^{30}-GLP-1(7-36)NH_2, Gly^8-Glu^{30}-GLP-1(7-37)OH, Gly^8-Glu^{30}-GLP-1(7-36)NH_2, Leu^8-Glu^{30}-GLP-1(7-37)OH, Leu^8-Glu^{30}-GLP-1(7-36)NH_2, Ile^8-Glu^{30}-GLP-1(7-37)OH, Ile^8-Glu^{30}-GLP-1(7-36)NH_2, Ser^8-Glu^{30}-GLP-1(7-37)OH, Ser^8-Glu^{30}-GLP-1(7-36)NH_2, Thr^8-Glu^{30}-GLP-1(7-37)OH, Thr^8-Glu^{30}-GLP-1(7-36)NH_2, Val^8-His^{37}-GLP-1(7-37)OH, Val^8-His^{37}-GLP-1(7-36)NH_2, Gly^8-His^{37}-GLP-1(7-37)OH, Gly^8-His^{37}-GLP-1(7-36)NH_2, Leu^8-His^{37}-GLP-1(7-37)OH, Leu^8-His^{37}-GLP-1(7-36)NH_2, Ile^8-His^{37}-GLP-1(7-37)OH, Ile^8-His^{37}-GLP-1(7-36)NH_2, Ser^8-His^{37}-GLP-1(7-37)OH, Ser^8-His^{37}-GLP-1(7-36)NH_2, Thr^8-His^{37}-GLP-1(7-37)OH, Thr^8-His^{37}-GLP-1(7-36)NH_2.

27. A GLP-1 compound comprising an extended GLP-1 peptide modified with a reactive group that reacts with a thiol group on a blood component to form a covalent bond, wherein said reactive group is a succinimidyl group, said extended GLP-1 peptide having the amino acid sequence of formula 3 (SEQ ID NO:3)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}

Formula 3 (SEQ ID NO:3)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, Ser, L-Cys, D-Cys, homocysteine, or penicillamine;

Xaa_{38} is: Ser, Pro, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2;

Xaa_{39} is: Ser, Arg, Thr, Trp, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{40} is: Ser, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{42} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent; and

Xaa_{48} is: L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

wherein said extended GLP-1 peptide contains a single L-Cys, D-Cys, homocysteine, or penicillamine which occurs at one of Xaa_{37}, Xaa_{38}, Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, or Xaa_{48}, said GLP-1 is modified at said single L-Cys, D-Cys, homocysteine, or penicillamine; and provided that if Xaa_{39}, Xaa_{40}, Xaa_{41}, Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, or Xaa_{47} is absent each amino acid downstream is absent and further provided that the GLP-1 peptide does not have the following C-terminal amino acid extension beginning at Xaa_{36}: Gly-Pro-Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH_2.

28. A GLP-1 compound comprising an extended GLP-1 peptide modified with a reactive group that reacts with a thiol group on a blood component to form a covalent bond, wherein said reactive group is a succinimidyl group, said extended GLP-1 peptide having the amino acid sequence of formula 6 (SEQ ID NO:6)

Xaa_7-Xaa_8-Glu-Gly-Thr-Xaa_{12}-Thr-Ser-Asp-Xaa_{16}-Ser-Xaa_{18}-Xaa_{19}-Xaa_{20}-Glu-Xaa_{22}-Gln-Ala-Xaa_{25}-Lys-Xaa_{27}-Phe-Ile-Xaa_{30}-Trp-Leu-Xaa_{33}-Xaa_{34}-Gly-Xaa_{36}-Xaa_{37}-Xaa_{38}-Xaa_{39}-Xaa_{40}-Xaa_{41}-Xaa_{42}-Xaa_{43}-Xaa_{44}-Xaa_{45}-Xaa_{46}-Xaa_{47}-Xaa_{48}-Xaa_{49}-Xaa_{50}-Xaa_{51}

Formula 6 (SEQ ID NO:6)

wherein:

Xaa_7 is: L-histidine, D-histidine, desamino-histidine, 2-amino-histidine, β-hydroxy-histidine, homohistidine, α-fluoromethyl-histidine, or α-methyl-histidine;

Xaa_8 is: Ala, Gly, Val, Leu, Ile, Ser, or Thr;

Xaa_{12} is: Phe, Trp, or Tyr;

Xaa_{16} is: Val, Trp, Ile, Leu, Phe, or Tyr;

Xaa_{18} is: Ser, Trp, Tyr, Phe, Lys, Ile, Leu, Val;

Xaa_{19} is: Tyr, Trp, or Phe;

Xaa_{20} is: Leu, Phe, Tyr, or Trp;

Xaa_{22} is: Gly, Glu, Asp, or Lys;

Xaa_{25} is: Ala, Val, Ile, or Leu;

Xaa_{27} is: Glu, Ile, or Ala;

Xaa_{30} is: Ala or Glu

Xaa_{33} is: Val or Ile;

Xaa_{34} is: Lys, Asp, Arg, or Glu;

Xaa_{36} is: Gly, Pro, or Arg;

Xaa_{37} is: Gly, Pro, or Ser;

Xaa_{38} is: Ser, Pro, or His;

Xaa_{39} is: Ser, Arg, Thr, Trp, or Lys;

Xaa_{40} is: Ser or Gly;

Xaa_{41} is: Ala, Asp, Arg, Glu, Lys, or Gly;

Xaa_{42} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{43} is: Pro, Ala, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{44} is: Pro, Ala, Arg, Lys, His, NH_2, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{45} is: Ser, His, Pro, Lys, Arg, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{46} is: His, Ser, Arg, Lys, Pro, Gly, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{47} is: His, Ser, Arg, Lys, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{48} is: Gly, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{49} is: Pro, His, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;

Xaa_{50} is: Ser, His, Ser-NH_2, His-NH_2, L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent; and

Xaa_{51} is: L-Cys, D-Cys, homocysteine, penicillamine, NH_2, or is absent;
wherein said extended GLP-1 peptide contains a single L-Cys, D-Cys, homocysteine, or penicillamine which occurs at one of Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, Xaa_{50}, or Xaa_{51} said GLP-1 is modified at said single L-Cys, D-Cys, homocysteine, or penicillamine; and provided that if Xaa_{42}, Xaa_{43}, Xaa_{44}, Xaa_{45}, Xaa_{46}, Xaa_{47}, Xaa_{48}, Xaa_{49}, or Xaa_{50}, is absent each amino acid downstream is absent and further provided that if Xaa_{36} is Arg and Xaa_{37} is Gly or Ser, the GLP-1 peptide does not have the following C-terminal amino acid extension beginning at Xaa_{38}: Ser-Ser-Gly-Ala-Pro-Pro-Pro-Ser-NH_2.

29. The GLP-1 compound of any of Claims 2, 3, 9, 10, 18, 19, or 26 provided that the GLP-1 compound does not differ from GLP-1(7-37)OH or GLP-1(7-36)NH_2 by more than 5 amino acids.

30. The GLP-1 compound of Claim 29 provided that the GLP-1 compound does not differ from GLP-1(7-37)OH or GLP-1(7-36)NH_2 by more than 4 amino acids.

31. The GLP-1 compound of Claim 30 provided that the GLP-1 compound does not differ from GLP-1(7-37)OH or GLP-1(7-36)NH_2 by more than 3 amino acids.

32. The GLP-1 compound of any of Claims 4-8, 11-15, 20-23, 27 or 28 wherein the first 31 amino acids of the peptide do not differ from GLP-1(7-37) by more than 6 amino acids.

33. The GLP-1 compound of Claim 32 wherein the first 31 amino acids of the peptide do not differ from GLP-1(7-37) by more than 5 amino acids.

34. The GLP-1 compound of Claim 33 wherein the first 31 amino acids of the peptide do not differ from GLP-1(7-37) by more than 4 amino acids.

35. The GLP-1 compound of Claim 33 wherein the first 31 amino acids of the peptide do not differ from GLP-1(7-37) by more than 3 amino acids.

36. A conjugate comprising a GLP-1 compound of any of claims 1 through 35 covalently bonded ex vivo to a blood component.

37. A conjugate comprising a GLP-1 compound of any of claims 1 through 35 covalently bonded ex vivo to a blood serum albumin.

38. A method for extending the in vivo half-life of a GLP-1 compound as claimed in any of claims 1 through 35, comprising reacting said reactive group of said pharmaceutical composition with a thiol group on a blood component in vivo.

39. A method for extending the in vivo half-life of a GLP-1 compound as claimed in any of claims 1 through 35, comprising reacting said reactive group of said pharmaceutical composition with a thiol group on blood serum albumin in vivo.

40. A method of stimulating the GLP-1 receptor in a subject in need of such stimulation, said method comprising the step of administering to the subject an effective amount of the GLP-1 compound of any one of Claims 1 through 35.

41. The method of Claim 40 wherein the subject is being treated for non-insulin dependent diabetes.

42. The method of Claim 40 wherein the subject is being treated prophylactically for non insulin dependent diabetes.

43. The method of Claim 40 wherein the subject is being treated for obesity.

44. The method of Claim 40 wherein the subject is being treated for stroke, myocardial infarction, stroke, stress-induced hyperglycemia, or irritable bowel syndrome.

45. The use of a GLP-1 compound of any one of Claims 1 through 35 in the manufacture of a medicament for the treatment of non-insulin dependent diabetes, obesity, stroke, myocardial infarction, stress-induced hyperglycemia, or irritable bowel syndrome.

46. The use of Claim 45 wherein the medicament is used to treat non-insulin dependent diabetes.

47. The use of claim 45 wherein the medicament is used to treat obesity.